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Astrophysical bounds from red and blue shift limits in spherical and axisymmetric spacetimes

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Testing gravity on low and high energy domains is essential to reconcile primordial and late times. Focusing on local and cosmic scales, red and blue shift measures between two observers plays a crucial role. We revise their use in two distinct contexts, making use of de Sitter–Schwarzschild solution and q-metric to describe low and higher energy regimes. First, we assume de Sitter–Schwarzschild space-time whose contribution comes from the cosmological constant. We study this model both for Earth and Mars (in the Solar System regime) and for neutron stars and white dwarfs, as different sources of the gravitational field. By assuming the value of Λ given by Planck's measurements, we get a suitable red and blue shift range as function of the position of the observer who receives the photon emitted by the other one. Analogously, we consider the q-metric, i.e. the first extension to the spherically symmetric Schwarzschild solution, for the same sources as before. By fixing the value of the δ parameter of the theory, we get another suitable red and blue shift range as function of the position of the photon detector. Thus, a non-direct test of the theory can be exploited through an experimental setup that measures the red or the blue shift from a given gravitational source.

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